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NEW ENTOCYTHERID OSTRACODS FROM
TENNESSEE AND VIRGINIA

BY HORTON H. HOBBS, JR. AND MARGARET WALTON
*Smithsonian Institution and
Mountain Lake Biological Station*

Four new ostracods belonging to the genera *Ascetocythere* and *Dactylocythere* are described from the upper Tennessee and Cumberland drainage systems in Tennessee and Virginia.

In examining specimens of *Dactylocythere spinata* (see below), we observed, for the first time, an unpaired, heavily sclerotized spinelike prominence, here designated the *sternal spine*, which extends posteriorly along the ventromedian line of the body between the first pair of legs. Although this spine was first observed in *Dt. spinata*, it occurs, in various forms, in males of at least 10 of the 27 described members of the genus (see below) and is particularly well-disposed for illustration in a paratypic male of *Dt. xystroides* Hobbs and Walton, 1963: 460, from Hurricane Creek, southeast of Waverly, Humphreys County, Tennessee (see Figs. 1a, b).

The sternal spine (ss) appears to articulate anteriorly with a pair of long, slender, paramedian *ventral prongs* (vp) which extend anteriorly between the bases of the maxillae (mx) and mandibles (md), and to be supported dorsolaterally by the *posteroventral horns* (pvh) of paired λ -shaped apodemes, the *anteroventral horns* (avh) of which are continuous with the respective right and left ventral prongs. Each of the latter bears a prominence (mds) which supports the mandible and from which a slender, simple trabecula extends to the maxilla of the respective side. The *dorsal horn* (dh) of the apodeme bears an anterior spur which supports a complex trabecula extending from the proximal base of the maxilla to the base of the mandible.



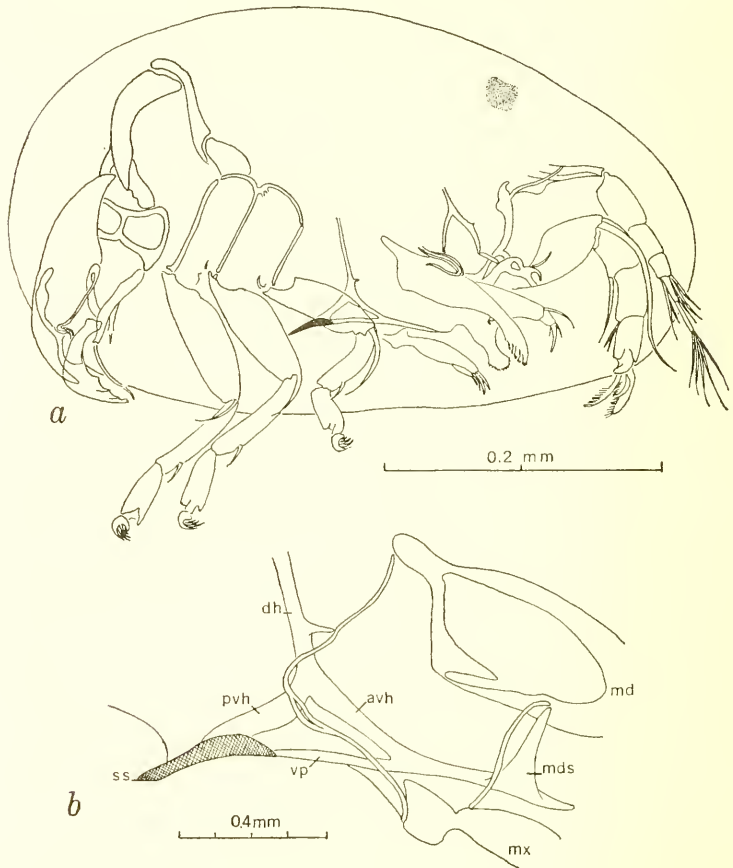


FIG. 1. *Dactylocythere xystroides*. a, Dextral view showing position of sternal spine (black); b, Apodeme and trabeculae associated with sternal spine. (See text for explanations of abbreviations.)

Rioja (1940 and 1941) made a careful study of the endoskeleton of *Ankylocythere heterodonta* (Rioja, 1940: 594) [= *Entocythere heterodonta*] but did not recognize most of the elements just described. Not only did we fail to find them in Rioja's species but we were also unable to identify them in certain species of the genus *Dactylocythere*, and only part of them were evident in others; thus, it is highly probable that if

they are present in *Ank. heterodonta* and in the members of the genus *Dactylocythere* not listed below, they are not strongly sclerotized and consequently are not visible in available preparations.

Those species of *Dactylocythere* which possess sternal spines are: *Dt. amicula* Hart and Hart, 1966: 1; *Dt. brachystrix* Hobbs and Walton, 1966: 2; *Dt. chalaza* (Hobbs and Walton, 1962: 45); *Dt. chelomata* (Crawford, 1961: 242); *Dt. daphnioides* (Hobbs, 1955: 325); *Dt. exoura* Hart and Hart, 1966: 5; *Dt. pachysphyrata* Hobbs and Walton, 1966: 3; *Dt. runki* (Hobbs, 1955: 330); *Dt. spinata*, new species; and *Dt. xystroides* Hobbs and Walton, 1963a: 460.

Three of the remaining species of the genus—*Dt. jeanae* Hobbs, 1967: 6; *Dt. striophylax* (Crawford, 1959: 157); and *Dt. suteri* (Crawford, 1959: 162)—possess the paired λ -shaped apodemes and ventral prongs, and the posterior extremities of the latter are produced posteriorly into small lobes, but no remnant of the sternal spine has been observed in any of the three.

Those species of the genus which are not listed above appear not to have the λ -shaped apodemes, and the ventral prongs, if present, are not sclerotized in our specimens.

Acknowledgments: We wish to thank Raymond W. Bouchard, Perry C. and Virgie F. Holt for furnishing us with the specimens on which *Ascetocythere holti* and *Dactylocythere spinata* are based. For criticisms of the manuscript, we are indebted to Fenner A. Chace, Jr.

***Ascetocythere holti* new species**

(Figures 2a, b, 3a, b)

Male: Eye pigmented. Shell (Fig. 2a) ovate in silhouette but slightly concave anteroventrally, greatest height slightly posterior to midlength. Submarginal setae anteriorly, posteriorly, and ventrally; those situated anteriorly progressively farther from margin dorsally; setae apparently absent dorsally.

Copulatory complex (Figs. 3a, b) with peniferum bearing three prominences extending from subterminal expansion: anterior process flattened, its length about half that of anteroposterior plane of distal portion of peniferum, and directed anteroventrally with distal portion deflected more ventrally; ventral process slightly heavier, subequal in length to ante-

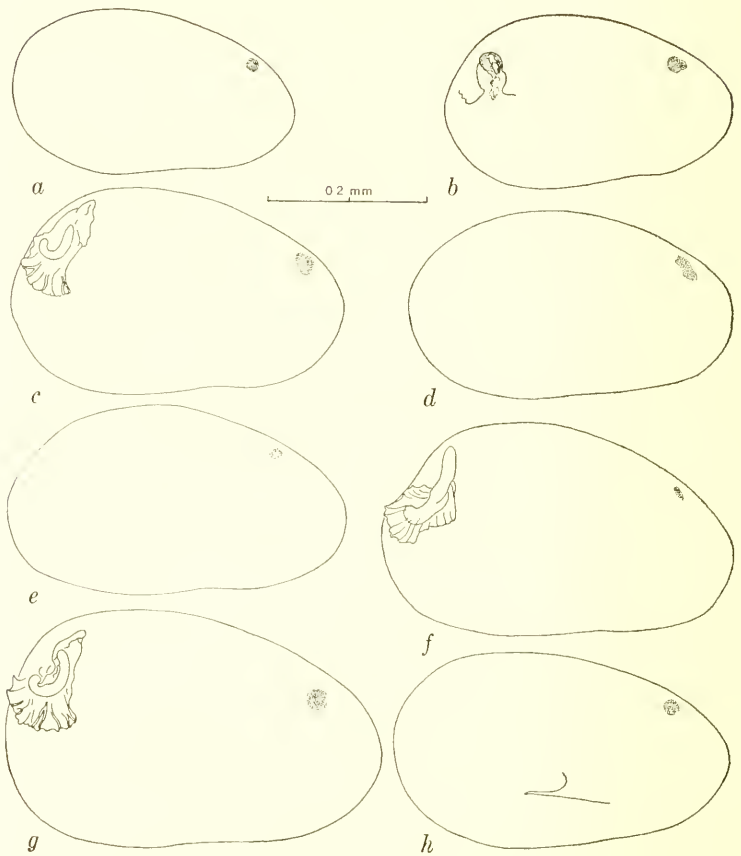


FIG. 2. Right valves of shells. a, d, e, h, Males; b, c, f, g, Females; a, b, *Ascetocythere holti* new species; c, d, *Dactylocythere enoploholca* new species; e, f, *Dactylocythere myura* new species; g, h, *Dactylocythere spinata* new species.

rior process, directed ventrally, and bearing fold along proximoposterior margin serving as penis guide; posterior process, situated immediately posterior to ventral process, slightly undulating, acute, about one-half as long as latter, and also directed ventrally. Penis complex long and extending ventrally along penis guides on posterior surface of ventral process. Clasp apparatus not clearly divisible into vertical and horizontal rami; internal border gently curved between broad base and

tapering distal portion, and bearing two or three inconspicuous elevations along distal third (distal elevation acute, almost toothlike in some specimens); distal extremity with three anterodorsally directed denticles; external border also rounded with broadly oblique subangular bend; extensions of principal proximal and distal axes forming angle of approximately 105 degrees; height of distal extremity of tapering apparatus only approximately one-fourth anteroposterior diameter of base of apparatus. Dorsal finger comparatively stout and terminating in bifid seta extending posteroventrally; ventral finger moderately heavy, disposed somewhat subparallel to anterior margin of ventral portion of periferum, with one subangular bend, and directed posteroventrally.

Triunguis Female: Eye pigmented. Shell (Fig. 2b) similar in shape to that of male but distinctly higher in posterior third; submarginal setae disposed as in male.

Genital complex consisting of sclerotized papilla surrounded by amorphous hyaline material (presumably the spermatophore) with dangling, irregularly shaped, delicate saclike membrane.

Measurements (in millimeters):

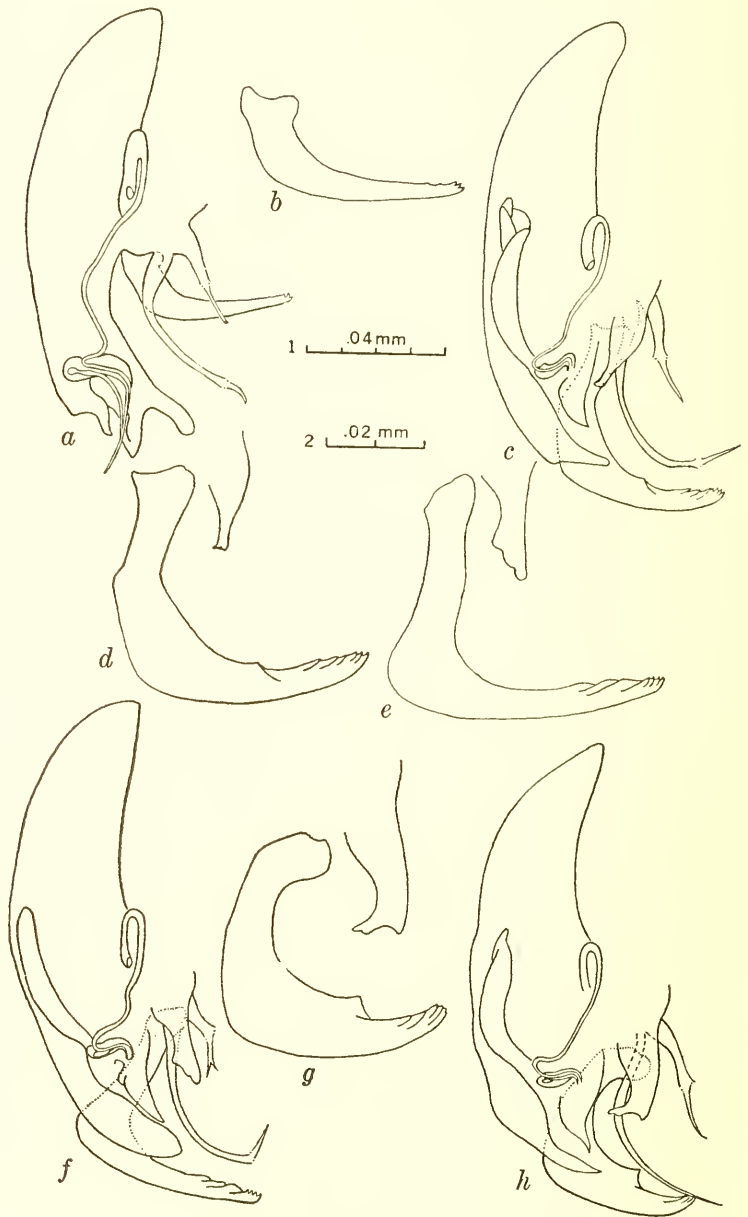
	Holotype	Males	Allotype	Females
Number of specimens		10		10
Length (range)	0.39	0.37-0.41	0.40	0.38-0.40
Average		0.39		0.39
Height (range)	0.22	0.21-0.24	0.24	0.24-0.25
Average		0.22		0.24

Type-locality: Stream, 8.3 miles west of junction of county roads 2451 and 3387 on latter, southeast of Oneida, Scott County, Tennessee.

Disposition of Types: The holotypic male and allotype are deposited in the National Museum of Natural History (Smithsonian Institution) no. 126974. Paratypes are in the collections of C. Willard Hart, Jr. (1 ♂, 1 ♀), H. H. Hobbs III (1 ♂, 1 ♀), and in the Smithsonian Institution (22 ♂, 3 ♀).

Hosts: *Cambarus (Depressicambarus) sphenoides* Hobbs, an unidentified crayfish related to *Cambarus (Jugicambarus) distans* Rhoades, and another related to *Cambarus (J.) obeyensis* Hobbs and Shoup.

Range and Entocytherid Associates: TENNESSEE (Cumberland River drainage system)—Anderson County: Tributary to New River, 4.4 miles E. of Shea, with no entocytherid associates. Campbell County: Small stream, 1.5 miles E. of Shea, with *Donnaldsoncythere tuberosa* (Hart and Hobbs, 1961: 182) and *Dactylocythere* sp.; Small stream, 9 miles S.W. of Caryville on road to Shea, with *Dn. tuberosa*, *Dt. spinata*, and *Entocythere* sp. Fentress County: Campbell Branch, 0.4 mile N.W. of junction of Tenn. Rte. 52 and unnumbered road near Armathwaite,



with *Dn. tuberosa* and *Dactylocythere* sp. Morgan County: Mud Creek at Tenn. Rte. 52, with *Dn. tuberosa*; White Oak Creek on U.S. Hwy. 27 at Sunbright, with *Dn. tuberosa* and *Dt. spinata*. Scott County: Type-locality, with *Dn. tuberosa* and *Dt. sp.*; Bandy Creek W. of Leatherwood Fork, with *Dn. tuberosa*, *Dt. spinata*, and *Entocythere* sp.; Painted Rock Creek on Tenn. Rte. 63, E. of Huntsville, with *Dn. tuberosa*; Perkins Creek at U. S. Hwy. 27, N.E. of Winfield, with *Dn. tuberosa*, *Dactylocythere* sp., and *Entocythere* sp.

Relationships: *Ascetocythere holti* is a member of the Asceta Group of the genus and seems to have its closest affinities with *A. sclera* Hobbs and Hart, 1966: 42. It shares with all of the species of the group a clasping apparatus in which the major bend occurs proximal to its midlength, and with *A. sclera*, *A. didactylata* Hobbs and Hart, 1966: 43, and *A. batchi* Hobbs and Walton, 1968: 237, the absence of a flangelike process projecting from the ventral surface of the peniferum. It differs from *A. didactylata* in possessing three processes on the ventral portion of the peniferum, from *A. sclera* in having a much longer anterior process, an acute, undulating posterior process, and a subangular bend on the posteroventral margin of the peniferum, and from *A. batchi* in possessing a posterior process.

Etymology: It is a pleasure to name this species in honor of our good friend and colleague, Dr. Perry C. Holt, who has contributed numerous specimens of crayfishes and entocytherids to us.

***Dactylocythere enoploholca* new species**

(Figures 2c, d, 3c, d)

Male: Eye pigmented, situated approximately one-eighth shell length from anterior margin. Shell (Fig. 2d) ovate with greatest height distinctly posterior to midlength. Submarginal setae present except dorsally between level of posterior margin of eye and that of dorsal portion of peniferum. Sternal spine lacking.

Copulatory complex (Figs. 3c, d) with finger guard broad at base and tapering to form narrow distal portion, ventral margin emarginate with posteriorly directed acute tip; peniferum moderately heavy with subtruncate ventral margin and posteroventral "heel"; accessory groove reaching level slightly dorsal to dorsal margin of spermatid loop, with its dorsalmost portion folded and possessing irregular margin; peniferal groove opening anteriorly, its apical width approximately two-thirds that

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FIG. 3. Copulatory complexes. a, c, f, h, Entire complexes drawn to scale 1; b, d, e, g, Finger guards and clasping apparatus drawn to scale 2; a, b, *Ascetocythere holti* new species; c, d, *Dactylocythere enoploholca* new species; e, f, *Dactylocythere myura* new species; g, h, *Dactylocythere spinata* new species.

of diameter of vertical ramus of clasping apparatus above rounded shoulder (see below); penis somewhat L-shaped, situated in ventral fourth of peniferum; clasping apparatus, extending ventrally beyond ventral margin of peniferum, with two major bends, but not clearly divisible into vertical and horizontal rami and with major axes of extremities forming angle of approximately 70 degrees; external borders of both rami entire but that of vertical ramus with rounded shoulder at midlength (level of proximal bend); internal border of horizontal ramus with one large tooth near midlength and with three low elevations immediately proximal to three apical denticles. Both dorsal and ventral fingers moderately slender, latter more than twice length of former, gently curved from base and suddenly curved posteriorly at base of distal third.

Triunguis Female: Eye pigmented and situated as in male. Shell (Fig. 2c) distinctly larger than that of most males, more highly vaulted posteriorly, and with shallow ventral excavation anterior to midlength. Submarginal setae present except dorsally between level of eye and genital complex.

Genital complex consisting of prominent, but short, J-shaped rod and amiculum, latter protruding little, if at all, between valves.

Measurements (in millimeters):

	Holotype	Males	Allotype	Females
Number		10		10
Length (range)	0.46	0.44-0.49	0.47	0.46-0.55
Average		0.45		0.50
Height (range)	0.25	0.25-0.28	0.29	0.28-0.34
Average		0.27		0.30

Type-locality: South Fork of the Holston River at junction of state routes 600 and 762, Washington County, Virginia. This is the only locality in which this species is known to occur.

Disposition of Types: The holotypic male and allotype are deposited in the National Museum of Natural History (Smithsonian Institution) no. 126973. Paratypes are in the collections of C. Willard Hart, Jr. (1 ♂, 1 ♀), H. H. Hobbs III (1 ♂, 1 ♀), and in the Smithsonian Institution (3 ♂, 3 ♀).

Hosts: The type-series was obtained from a collection of *Cambarus (Hiaticambarus) longirostris* Faxon and *Cambarus (Puncticambarus)* sp.

Entocytherid Associate: *Dactylocythere falcata* (Hobbs and Walton, 1961: 379).

Relationships: *Dactylocythere enoploholca* has as its closest relatives *Dt. chalaza*, *Dt. pachysphyrata*, and *Dt. spinata*. In all four species, the accessory groove extends dorsally approximately to the level of the

spermatic loop; the aperture of the peniferal groove is directed anteriorly; and the clasping apparatus is curved at almost the same angle and bears only one major tooth (two in *Dt. pachysphyrata*) on the internal border of the clasping apparatus. *Dactylocythere enoploholca* differs from the other three, however, in having a heel-like prominence on the posteroventral margin of the peniferum, a prominent rounded shoulder on the external border of the vertical ramus of the clasping apparatus, and in lacking a sternal spine.

Etymology: *Enoplus* (Greek) = armed, and *holkos* = furrow; so named because of the folded irregular dorsal extremity of the accessory groove of the peniferum of the male.

***Dactylocythere myura* new species**

(Figures 2e, f, 3e, f)

Male: Eye pigmented, situated approximately one-fifth shell length from anterior margin. Shell (Fig. 2e) elongate ovate with greatest height at midlength. Submarginal setae present anteriorly, posteriorly, and ventrally, but none present dorsally between level of eye and dorsal portion of peniferum. Sternal spine lacking.

Copulatory complex (Figs. 3e, f) with finger guard rather heavy, its posterior margin concave and its oblique distal margin with three prominences of which anteriormost extending considerably farther ventrally than posterior one; peniferum moderately heavy with rounded ventral margin lacking tubercles, emarginations, or scallops; accessory groove reaching level of dorsal margin of spermatic loop with simple round dorsal extremity; peniferal groove opening anteriorly, its apical width narrow, no more than one-fourth least diameter of vertical ramus of clasping apparatus; penis L-shaped and situated at base of distal fourth of peniferum; clasping apparatus also L-shaped with vertical ramus slightly bowed anteriorly, extending ventrally beyond peniferum, clearly divisible into vertical and horizontal rami, and major axes forming angle of approximately 85 degrees; external borders of both rami and internal border of vertical ramus entire, that of vertical ramus lacking shoulder; internal border of horizontal ramus usually without teeth but with three low elevations distal to midlength (elevations occasionally subacute), and bearing three or four small dorsally directed denticles. Dorsal finger somewhat heavier than ventral and terminating in bifid tip; ventral finger gently curved throughout its length.

Triunguis Female: Eye pigmented and situated slightly more anteriorly than that of male. Shell (Fig. 2f), while scarcely longer than that of male, distinctly more highly vaulted with greatest height posterior to midlength, and with much steeper slope posterodorsally; ventral margin with only faintest indication of shallow excavation anterior to midlength. Submarginal setae distributed as in male.

Genital complex consisting of prominent, long J-shaped rod and long amiculum, latter sometimes slightly protruding between valves.

Measurements (in millimeters):

	Holotype	Males	Allotype	Females
Number		9		5
Length (range)	0.48	0.46-0.48	0.48	0.48
Average		0.47		0.48
Height (range)	0.27	0.25-0.27	0.29	0.27-0.29
Average		0.27		0.28

Type-locality: Burrows along bank of spring-fed stream, 3.5 miles southwest of Chilhowie in Washington County, Virginia (Holston River drainage system).

Disposition of Types: The holotypic male and allotype are deposited in the National Museum of Natural History (Smithsonian Institution) no. 126975. Paratypes are in the collections of C. Willard Hart, Jr. (1 ♂, 2 ♀), H. H. Hobbs III (1 ♂, 1 ♀), and in the Smithsonian Institution (4 ♂, 2 ♀).

Host: An undescribed crayfish closely allied to *Cambarus carolinus* Erichson.

Range and Entocytherid Associates: *Dactylocythere myura* is known from only one locality other than the type-locality, 1.0 mile southwest of Chilhowie off Interstate Hwy. 81, Smyth County, Virginia—only 2.5 miles from the type-locality and also in the Holston drainage system. In the type-locality, it was associated with *Donnaldsoncythere scalis* Hobbs and Walton, 1963b: 364, and in the Smyth County locality with *Dn. scalis* and *Ascetocythere hyperoche* Hobbs and Hart, 1966: 41.

Relationships: While *Dt. myura* is not obviously closely allied to any other species of the genus, the comparatively slender clasping apparatus and the finger guard with three lobes of which the anterior one extends farthest distally are somewhat like those found in *Dt. suteri*. It may be readily separated from the latter, however, by the more angular clasping apparatus which bears no more than one distinct tooth proximal to the apical denticles, and the distal margin of the finger guard is oblique rather than subtruncate. Its more distant relatives include *Dt. jeanae* and *Dt. striophylax*; in neither of these, however, is the finger guard distinctly trilobed distally.

Etymology: *Myurus* (Greek) = narrow; alluding to the narrow horizontal ramus of the clasping apparatus of the male.

***Dactylocythere spinata* new species**

(Figures 2g, h, 3g, h)

Male: Eye pigmented, situated slightly more than one-fourth shell length from anterior margin. Shell (Fig. 2h) elongate ovate with greatest height some distance posterior to midlength. Marginal setae present anteriorly, posteriorly, and ventrally. Sternal spine prominent, long, directed posteriorly with apical portion only slightly bent ventrally.

Copulatory complex (Figs. 3g, h) with finger guard rather heavy, its posterior margin deeply convex anteriorly, and its ventral border excavate with anteroventral prominence decidedly smaller than bituberculate, posteroventrally directed posterior prominence, thus ventral margin with three prominences; peniferum moderately heavy with posterior margin slightly undulating, but nowhere angulate or with lobes, and terminating in anteriorly directed acute tip; peniferal groove, only slightly wider at apex than one-half least diameter of vertical ramus of clasping apparatus, and directed anteriorly; penis L-shaped and situated approximately at base of ventral fourth of peniferum; clasping apparatus clearly divisible into vertical and horizontal rami with major axes forming angle of approximately 80 degrees although vertical ramus with proximal portion bent anteriorly, almost paralleling horizontal ramus. External border of both rami and internal border of vertical ramus entire and external border of vertical ramus without conspicuous shoulder; internal border of horizontal ramus with single large tooth near midlength and two or three exceedingly low prominences immediately proximal to three small apical denticles; clasping apparatus thickest in region of junction of two rami, tapering slightly proximally and distally; portion of horizontal ramus distal to major tooth not nearly so thick as that proximal to it.

Triunguis Female: Eye pigmented and located slightly more anteriorly than that of male. Shell (Fig. 2g) much more highly vaulted posteriorly than in male, with greatest height some distance posterior to midlength and with posterior margin subtruncate; ventral margin with shallow excavation at about midlength. Submarginal setae disposed as in male.

Genital complex consisting of prominent J-shaped rod and ruffled amiculum, frequently with small portion of latter slightly protruding posteriorly beyond margins of valves.

Measurements (in millimeters):

	Holotype	Males	Allotype	Females
Number		8		9
Length (range)	0.46	0.44-0.48	0.48	0.45-0.49
Average		0.46		0.47
Height (range)	0.27	0.27-0.29	0.30	0.28-0.32
Average		0.27		0.30

Type-locality: Small stream, 9.0 miles southwest of Caryville on county road to Shea, Campbell County, Tennessee (Cumberland River drainage system).

Disposition of Types: The holotypic male and allotype are deposited in the National Museum of Natural History (Smithsonian Institution), no. 126972. Paratypes are in the collections of C. Willard Hart, Jr. (1 ♂, 1 ♀), H. H. Hobbs III (1 ♂, 1 ♀) and in the Smithsonian Institution (7 ♂, 6 ♀).

Host: A crayfish tentatively identified as *Cambarus (J.) distans* Rhoades.

Range and Entocytherid Associates: TENNESSEE (Cumberland River drainage system)—Campbell County: Type-locality, with *As. holti*, *Donnalsoncythere tuberosa*, and *Entocythere* sp. Fentress County: Laurel Fork, 9.7 miles N.E. of Jamestown on Tenn. Rte. 154, with *Dactylocythere* sp. Morgan County: White Oak Creek on U. S. Hwy. 27 at Sunbright, with *As. holti* and *Dn. tuberosa*. Scott County: Bandy Creek W. of Leatherwood Fork, with *As. holti*, *Dn. tuberosa*, and *Entocythere* sp.

Relationships: *Dactylocythere spinata* has its closest affinities with *Dt. chalaza* and its allies (see discussion of relationships of *Dt. enoploholca* above), and it is more similar to this species than to the other two. It differs from *Dt. pachysphyrata* in having only a single major tooth on the internal border of the horizontal ramus of the clasping apparatus, a bituberculate posteroventral prominence on the finger guard, and a sternal spine that is directed posteriorly rather than ventrally. In *Dt. chalaza*, the posteroventral prominence on the finger guard is not bituberculate, the guard is not strongly bowed anteriorly, and the sternal spine is directed posteroventrally rather than posteriorly. It differs from *Dt. enoploholca* in possessing a sternal spine and in lacking a heel-like prominence on the posteroventral margin of the peniferum.

Etymology: *Spina* (L.) = spine; referring to the long sternal spine of the male.

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